

Claims

[c1] 1. A portable gas-fired infrared heater comprising:

- (a) a housing enclosing a burner assembly including a gas valve adapted to receive fuel from an associated fuel supply and communicating with an orifice, the orifice being located to direct fuel to a venturi for mixing with air which, in turn, communicates with a rear face of a radiant surface where combustion occurs, the housing further including an air inlet for communicating air to the venturi;
- (b) said housing at least partially enclosing at least one fuel source; and
- (c) an oxygen depletion monitoring means associated with the burner assembly for automatically shutting off the burner assembly at a predetermined content of at least one gas selected from the group consisting of oxygen, carbon dioxide and carbon monoxide.

[c2] 2. The portable heater of claim 1 which further comprises

- (a) a handle spaced from the radiant surface.

[c3] 3. The portable heater of claim 2 which further comprises

- (a) at least two legs that elevate the housing relative to an associated support surface.
- [c4] 4. The portable heater of claim 2 which further comprises
 - (a) at least one recess in the housing for hanging the heater.
- [c5] 5. The portable heater of claim 4 wherein
 - (a) the recess is a key-shaped opening.
- [c6] 6. The portable heater of claim 4 wherein
 - (a) the recess is located on a surface of the housing spaced from the radiant surface.
- [c7] 7. The portable heater of claim 1 which further comprises
 - (a) an igniter secured to the housing for initiating combustion at the radiant surface.
- [c8] 8. The portable heater of claim 1 wherein
 - (a) the housing is dimensioned to enclose at least an upper portion of said at least one fuel source.
- [c9] 9. The portable heater of claim 8 wherein
 - (a) said at least one fuel source is at least a one pound propane fuel tank.
- [c10] 10. The portable heater of claim 9 wherein

(a) said at least one fuel source is at least two one pound propane fuel tanks.

- [c11] 11. The portable heater of claim 8 wherein
 - (a) said at least one fuel source is completely enclosed within said housing.
- [c12] 12. The portable heater of claim 10 wherein
 - (a) said at least two one pound propane fuel tanks are completely enclosed within said housing.
- [c13] 13. The portable heater of claim 1 which further comprises
 - (a) a controller for selectively switching operation of the portable heater among at least discrete off, pilot, low, and high positions.
- [c14] 14. The portable heater of claim 1 which further comprises
 - (a) a controller for continuous variable operation of the portable heater.
- [c15] 15. The portable heater of claim 13 wherein
 - (a) the controller includes a control knob disposed in a housing recess for protecting against inadvertent contact.
- [c16] 16. The portable heater of claim 1 which further com-

prises

(a) an extended length hose assembly for connecting the heater to an associated remote fuel source.

[c17] 17. The portable heater of claim 1 which further comprises

(a) a regulator for reducing pressure from an associated fuel source.

[c18] 18. The portable heater of claim 17 wherein

(a) the regulator limits the pressure of an associated fuel source to approximately eleven inches water column.

[c19] 19. The portable heater of claim 1 which further comprises

(a) a thermocouple that monitors changes in temperature of a pilot flame associated with the radiant surface.

[c20] 20. The portable heater of claim 1 which further comprises

(a) a shield secured to the housing in overlapping relation to the radiant surface.

[c21] 21. The portable heater of claim 1 which further comprises

(a) at least one fan to increase air circulation through

said heater; and

(b) a power source for said at least one fan.

- [c22] 22. The portable heater of claim 21 wherein
 - (a) said power source is selected from the group consisting of at least one dry cell battery, at least one battery pack and a power cord configured to plug into a source of electricity.
- [c23] 23. The portable heater of claim 22 wherein
 - (a) said power source is rechargeable.
- [c24] 24. The portable heater of claim 1 which further comprises
 - (a) an access means to said at least one fuel source.
- [c25] 25. The portable heater of claim 24 wherein
 - (a) said access means is a door in said housing.
- [c26] 26. The portable heater of claim 1 which further comprises
 - (a) at least one pivotable fitting for connection to said at least one fuel source.
- [c27] 27. The portable heater of claim 10 wherein
 - (a) said at least two fuel sources are positioned on one side of said heater.
- [c28] 28. The portable heater of claim 10 wherein

(a) said at least two fuel sources are positioned on a rear side of said heater.

[c29] 29. The portable heater of claim 10 wherein

(a) said at least two fuel sources are positioned on opposed sides of said heater.

[c30] 30. The portable heater of claim 10 which further comprises

(a) an igniter for each fuel source.

[c31] 31. The portable heater of claim 30 which further comprises

(a) a controller for each fuel source.

[c32] 32. A portable radiant heater comprising:

(a) a housing having a handle for transporting the heater;

(b) an air inlet in the housing;

(c) a burner assembly mounted in the housing including at least one fuel valve adapted to operatively communicate with at least one associated fuel source and the air inlet; and

(d) a radiant surface having a rear face communicating with a plenum chamber and wherein the radiant surface is recessed in the housing and disposed at an angle; and

(e) an oxygen depletion system operatively associated with the burner assembly for automatically shutting off the fuel valve in response to detection of a predetermined level of at least one gas selected from the group consisting of oxygen, carbon dioxide and carbon monoxide.

- [c33] 33. The portable heater of claim 32 wherein
 - (a) the plenum chamber is adjacent to the radiant surface for distributing an associated air/fuel mixture over the rear face of the radiant surface.
- [c34] 34. The portable heater of claim 33 which further comprises
 - (a) a regulator for limiting the pressure of the associated fuel source to approximately eleven inches water column.
- [c35] 35. The portable heater of claim 34 which further comprises
 - (a) a control knob for selecting various modes of operation of the heater, the control knob located in a recess of the housing for limiting inadvertent contact.
- [c36] 36. The portable heater of claim 35 wherein
 - (a) the heater includes a controller for providing at

least 4000 BTUs/hour in a first operative state and at least 9000 BTUs/hour in a second operative state.

[c37] 37. The portable heater of claim 36 which further comprises

(a) an elongated hose assembly for interconnecting the heater to an associated remotely located fuel source.

[c38] 38. The portable heater of claim 32 wherein

(a) the housing includes at least one cavity dimensioned for receiving at least one associated fuel source therein.

[c39] 39. The portable heater of claim 32 which further comprises

(a) a venturi interposed between the at least one fuel valve and the radiant surface for mixing the associated fuel with air.

[c40] 40. The portable heater of claim 32 wherein

(a) said at least one fuel source is a one pound propane cylinder.

[c41] 41. The portable heater of claim 40 wherein

(a) said at least one fuel source is at least two one pound propane cylinders.

- [c42] 42. The portable heater of claim 32 which further comprises
 - (a) a thermocouple that monitors changes in temperature of a pilot flame associated with the radiant surface.
- [c43] 43. The portable heater of claim 32 which further comprises
 - (a) a shield secured to the housing in overlapping relation to the radiant surface.
- [c44] 44. The portable heater of claim 32 which further comprises
 - (a) at least one fan to increase air circulation through said heater; and
 - (b) a power source for said at least one fan.
- [c45] 45. The portable heater of claim 44 wherein
 - (a) said power source is selected from the group consisting of at least one dry cell battery, at least one battery pack and a power cord configured to plug into a source of electricity.
- [c46] 46. The portable heater of claim 45 wherein
 - (a) said power source is rechargeable.
- [c47] 47. The portable heater of claim 32 which further comprises

- (a) an access means to said at least one fuel source.
- [c48] 48. The portable heater of claim 47 wherein
 - (a) said access means is a door in said housing.
- [c49] 49. The portable heater of claim 32 which further comprises
 - (a) at least one pivotable fitting for connection to said at least one fuel source.
- [c50] 50. The portable heater of claim 41 wherein
 - (a) said at least two fuel sources are positioned on one side of said heater.
- [c51] 51. The portable heater of claim 41 wherein
 - (a) said at least two fuel sources are positioned on a rear side of said heater.
- [c52] 52. The portable heater of claim 41 wherein
 - (a) said at least two fuel sources are positioned on opposed sides of said heater.
- [c53] 53. The portable heater of claim 41 which further comprises
 - (a) an igniter for each fuel source.
- [c54] 54. The portable heater of claim 53 which further comprises
 - (a) a controller for each fuel source.

[c55] 55. A portable radiant heater comprising:

- (a) a housing for enclosing said heater and at least partially enclosing at least a one pound fuel source;
- (b) an air inlet in the housing;
- (c) a burner assembly mounted in the housing including a fuel valve adapted to operatively communicate with said at least one fuel source and the air inlet;
- (d) a radiant surface having a rear face communicating with a plenum chamber and wherein the radiant surface is recessed in the housing and disposed at an angle; and
- (e) an automatic shutoff mechanism operatively associated with the burner assembly for shutting off the fuel valve in response to a detection of a predetermined level of at least one gas selected from the group consisting of oxygen, carbon dioxide and carbon monoxide.

[c56] 56. The portable radiant heater of claim 55 wherein

- (a) the automatic shutoff mechanism includes a thermocouple that monitors changes in a temperature of a flame of the burner assembly indicative of changes in the concentration of a gas selected from the group consisting of oxygen, carbon dioxide and carbon monoxide.

- [c57] 57. The portable radiant heater of claim 56 wherein
 - (a) the automatic shutoff mechanism shuts off at approximately 100 ppm of carbon monoxide at approximately 18% oxygen levels.
- [c58] 58. The portable heater of claim 55 which further comprises
 - (a) an igniter secured to the housing for initiating combustion at the radiant surface.
- [c59] 59. The portable heater of claim 55 wherein
 - (a) the housing is dimensioned to enclose at least an upper portion of said at least one fuel source.
- [c60] 60. The portable heater of claim 59 wherein
 - (a) said at least one fuel source is at least a one pound propane fuel tank.
- [c61] 61. The portable heater of claim 59 wherein
 - (a) said at least one fuel source is at least two one pound propane fuel tanks.
- [c62] 62. The portable heater of claim 60 wherein
 - (a) said at least one fuel source is completely enclosed within said housing.
- [c63] 63. The portable heater of claim 61 wherein
 - (a) said at least two one pound propane fuel tanks

are completely enclosed within said housing.

- [c64] 64. The portable heater of claim 55 which further comprises
 - (a) a controller for selectively switching operation of the portable heater among at least discrete off, pilot, low, and high positions.
- [c65] 65. The portable heater of claim 55 which further comprises
 - (a) a controller for continuous variable operation of the portable heater.
- [c66] 66. The portable heater of claim 64 wherein
 - (a) the controller includes a control knob disposed in a housing recess for protecting against inadvertent contact.
- [c67] 67. The portable heater of claim 55 which further comprises
 - (a) an extended length hose assembly for connecting the heater to an associated remote fuel source.
- [c68] 68. The portable heater of claim 55 which further comprises
 - (a) a regulator for reducing pressure from an associated fuel source.

- [c69] 69. The portable heater of claim 68 wherein
 - (a) the regulator limits the pressure of an associated fuel source to approximately eleven inches water column.
- [c70] 70. The portable heater of claim 55 which further comprises
 - (a) a thermocouple that monitors changes in temperature of a pilot flame associated with the radiant surface.
- [c71] 71. The portable heater of claim 55 which further comprises
 - (a) a shield secured to the housing in overlapping relation to the radiant surface.
- [c72] 72. The portable heater of claim 55 which further comprises
 - (a) at least one fan to increase air circulation through said heater; and
 - (b) a power source for said at least one fan.
- [c73] 73. The portable heater of claim 72 wherein
 - (a) said power source is selected from the group consisting of at least one dry cell battery, at least one battery pack and a power cord configured to plug into a source of electricity.

- [c74] 74. The portable heater of claim 73 wherein
 - (a) said power source is rechargeable.
- [c75] 75. The portable heater of claim 55 which further comprises
 - (a) an access means to said at least one fuel source.
- [c76] 76. The portable heater of claim 75 wherein
 - (a) said access means is a door in said housing.
- [c77] 77. The portable heater of claim 76 which further comprises
 - (a) at least one pivotable fitting for connection to said at least one fuel source.
- [c78] 78. The portable heater of claim 61 wherein
 - (a) said at least two fuel sources are positioned on one side of said heater.
- [c79] 79. The portable heater of claim 61 wherein
 - (a) said at least two fuel sources are positioned on a rear side of said heater.
- [c80] 80. The portable heater of claim 61 wherein
 - (a) said at least two fuel sources are positioned on opposed sides of said heater.
- [c81] 81. The portable heater of claim 61 which further com-

prises

(a) an igniter for each fuel source.

[c82] 82. The portable heater of claim 81 which further comprises

(a) a controller for each fuel source.

[c83] 83. The portable heater of claim 1 which further comprises

(a) at least two wheels extending from a bottom of said housing.

[c84] 84. The portable heater of claim 83 wherein

(a) said at least two wheels is four wheels, each positioned at a corner of said bottom housing.

[c85] 85. The portable heater of claim 1 which further comprises

(a) at least two burner assemblies.

[c86] 86. The portable heater of claim 85 wherein

(a) said at least two burner assemblies are independently controlled.

[c87] 87. The portable heater of claim 32 which further comprises

(a) at least two wheels extending from a bottom of said housing.

- [c88] 88. The portable heater of claim 87 wherein
 - (a) said at least two wheels is four wheels, each positioned at a corner of said bottom housing.
- [c89] 89. The portable heater of claim 32 which further comprises
 - (a) at least two burner assemblies.
- [c90] 90. The portable heater of claim 89 wherein
 - (a) said at least two burner assemblies are independently controlled.
- [c91] 91. The portable heater of claim 55 which further comprises
 - (a) at least two wheels extending from a bottom of said housing.
- [c92] 92. The portable heater of claim 91 wherein
 - (a) said at least two wheels is four wheels, each positioned at a corner of said bottom housing.
- [c93] 93. The portable heater of claim 55 which further comprises
 - (a) at least two burner assemblies.
- [c94] 94. The portable heater of claim 93 wherein
 - (a) said at least two burner assemblies are independently controlled.

[c95] 95. The portable heater of claim 13 which further comprises

(a) a piezo igniter

96. The portable heater of claim 64 which further comprises

(a) a piezo igniter

97. The portable heater of claim 16 which further comprises

(a) a hose assembly recoil means.

[c96] 98. The portable heater of claim 37 which further comprises

(a) a hose assembly recoil means.

[c97] 99. The portable heater of claim 67 which further comprises

(a) a hose assembly recoil means.

[c98] 100. The portable heater of claim 97 wherein

(a) the hose assembly further comprises a positive fuel shutoff means at both ends of said hose assembly.

[c99] 101. The portable heater of claim 98 wherein

(a) the hose assembly further comprises a positive fuel shutoff means at both ends of said hose assembly.

[c100] 102. The portable heater of claim 99 wherein
(a) the hose assembly further comprises a positive fuel shutoff means at both ends of said hose assembly.

[c101] 103. A portable gas-fired infrared heater comprising:
(a) a housing enclosing a burner assembly including a gas valve adapted to receive fuel from an associated enclosed fuel supply comprising at least one 1-lb. cylinder for said fuel supply and communicating with an orifice, the orifice being located to direct fuel for mixing with air which, in turn, communicates with a radiant surface where combustion occurs; and
(b) an oxygen depletion monitoring means associated with the burner assembly for automatically shutting off the burner assembly at a predetermined content of at least one gas selected from the group consisting of oxygen, carbon dioxide and carbon monoxide.

[c102] 104. The portable heater of claim 103 which further comprises
(a) a handle spaced from the radiant surface.

[c103] 105. The portable heater of claim 103 which further comprises

(a) at least two legs that elevate the housing relative to an associated support surface.

[c104] 106. The portable heater of claim 103 which further comprises

(a) at least one recess in the housing for hanging the heater.

[c105] 107. The portable heater of claim 106 wherein

(a) the recess is a key-shaped opening.

[c106] 108. The portable heater of claim 106 wherein

(a) the recess is located on a surface of the housing spaced from the radiant surface.

[c107] 109. The portable heater of claim 103 which further comprises

(a) an igniter secured to the housing for initiating combustion at the radiant surface.

[c108] 110. The portable heater of claim 103 wherein

(a) said at least one fuel source is at least two one pound propane fuel tanks.

[c109] 111. The portable heater of claim 110 wherein

(a) said at least two one pound propane fuel tanks are completely enclosed within said housing.

[c110] 112. The portable heater of claim 103 which further

comprises

(a) a controller for selectively switching operation of the portable heater among at least discrete off, pilot, low, and high positions.

[c111] 113. The portable heater of claim 103 which further comprises

(a) a controller for continuous variable operation of the portable heater.

[c112] 114. The portable heater of claim 112 wherein

(a) the controller includes a control knob disposed in a housing recess for protecting against inadvertent contact.

[c113] 115. The portable heater of claim 103 which further comprises

(a) an extended length hose assembly for connecting the heater to an associated remote fuel source.

[c114] 116. The portable heater of claim 115 which further comprises

(a) a regulator for reducing pressure from an associated fuel source.

[c115] 117. The portable heater of claim 116 wherein

(a) the regulator limits the pressure of an associated fuel source to approximately eleven inches water col-

umn.

[c116] 118. The portable heater of claim 103 which further comprises

(a) a thermocouple that monitors changes in temperature of a pilot flame associated with the radiant surface.

[c117] 119. The portable heater of claim 103 which further comprises

(a) a shield secured to the housing in overlapping relation to the radiant surface.

[c118] 120. The portable heater of claim 103 which further comprises

(a) at least one fan to increase air circulation through said heater; and
(b) a power source for said at least one fan.

[c119] 121. The portable heater of claim 120 wherein

(a) said power source is selected from the group consisting of at least one dry cell battery, at least one battery pack and a power cord configured to plug into a source of electricity.

[c120] 122. The portable heater of claim 121 wherein

(a) said power source is rechargeable.

- [c121] 123. The portable heater of claim 103 which further comprises
 - (a) an access means to said at least one fuel source.
- [c122] 124. The portable heater of claim 123 wherein
 - (a) said access means is a door in said housing.
- [c123] 125. The portable heater of claim 123 which further comprises
 - (a) at least one pivotable fitting for connection to said at least one fuel source.
- [c124] 126. The portable heater of claim 111 wherein
 - (a) said at least two fuel sources are positioned on one side of said heater.
- [c125] 127. The portable heater of claim 111 wherein
 - (a) said at least two fuel sources are positioned on a rear side of said heater.
- [c126] 128. The portable heater of claim 111 wherein
 - (a) said at least two fuel sources are positioned on opposed sides of said heater.
- [c127] 129. The portable heater of claim 111 which further comprises
 - (a) an igniter for each fuel source.
- [c128] 130. The portable heater of claim 129 which further

comprises

- (a) a controller for each fuel source.

[c129] 131. A portable radiant heater comprising:

- (a) a housing for enclosing said heater
- (b) at least one 1-lb. fuel source in communication with said heater, said fuel source removable by pivotal movement from a first in-use position to a second replacement position;
- (c) an air inlet in the housing;
- (d) a burner assembly mounted in the housing including a fuel valve adapted to operatively communicate with said at least one fuel source and the air inlet;
- (e) a radiant surface in the housing where combustion occurs; and
- (f) an automatic shutoff mechanism operatively associated with the burner assembly for shutting off the fuel valve in response to a detection of a predetermined level of at least one gas selected from the group consisting of oxygen, carbon dioxide and carbon monoxide.

[c130] 132. The portable radiant heater of claim 131 wherein

- (a) the automatic shutoff mechanism includes a thermocouple that monitors changes in a temperature of a flame of the burner assembly indicative of changes

in the concentration of a gas selected from the group consisting of oxygen, carbon dioxide and carbon monoxide.

- [c131] 133. The portable radiant heater of claim 132 wherein
 - (a) the automatic shutoff mechanism shuts off at approximately 100 ppm of carbon monoxide at approximately 18% oxygen levels.
- [c132] 134. The portable heater of claim 131 which further comprises
 - (a) an igniter secured to the housing for initiating combustion at the radiant surface.
- [c133] 135. The portable heater of claim 131 wherein
 - (a) said at least one fuel source is at least a one pound propane fuel tank.
- [c134] 136. The portable heater of claim 135 wherein
 - (a) said at least one fuel source is at least two one pound propane fuel tanks.
- [c135] 137. The portable heater of claim 131 which further comprises
 - (a) a controller for selectively switching operation of the portable heater among at least discrete off, pilot, low, and high positions.

[c136] 138. The portable heater of claim 131 which further comprises

(a) a controller for continuous variable operation of the portable heater.

[c137] 139. The portable heater of claim 137 wherein

(a) the controller includes a control knob disposed in a housing recess for protecting against inadvertent contact.

[c138] 140. The portable heater of claim 131 which further comprises

(a) an extended length hose assembly for connecting the heater to an associated remote fuel source.

[c139] 141. The portable heater of claim 140 which further comprises

(a) a regulator for reducing pressure from an associated fuel source.

[c140] 142. The portable heater of claim 141 wherein

(a) the regulator limits the pressure of an associated fuel source to approximately eleven inches water column.

[c141] 143. The portable heater of claim 131 which further comprises

(a) a thermocouple that monitors changes in temper-

ature of a pilot flame associated with the radiant surface.

[c142] 144. The portable heater of claim 131 which further comprises

(a) a shield secured to the housing in overlapping relation to the radiant surface.

[c143] 145. The portable heater of claim 131 which further comprises

(a) an access means to said at least one fuel source.

[c144] 146. The portable heater of claim 145 wherein

(a) said access means is a door.